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## SUMMARY

### FINAL ENVIRONMENTAL IMPACT STATEMENT Alligator Chain of Lakes and Lake Gentry Extreme Drawdown

The Florida Fish and Wildlife Conservation Commission (FWC) has requested an extreme drawdown of the Alligator Chain of Lakes and Lake Gentry for the purpose of aquatic habitat enhancement. During the drawdown, bottom sediments would dry and compact, stimulating growth of desirable aquatic vegetation, improving habitat quality for fish and wildlife. The Alligator Chain and Lake Gentry are connected by a series of canals allowing water flow and navigation between the lakes. The South Florida Water Management District (SFWMD) operates water control structures S-58 to the north and S-60 to the south to maintain flood protection around these lakes. Prior to the construction of the Central and South Florida (C&SF) Project Works, ecological processes in and around the lakes depended on the climatic cycle of flood and drought. Extreme water fluctuations were a vital component in sustaining high quality aquatic and terrestrial habitat. The C&SF Project authorized purposes and regulation schedules have lead to a narrow restriction of the range in which water levels the lakes can fluctuate. This long-term stabilization of water levels has resulted in conditions favorable to the dense growth of nuisance vegetation that eventually precludes use of the lake shallows by fish, wading birds, wildlife, and the public.

This final Environmental Impact Statement (FEIS) provides documentation of the analysis of the proposed action and three other alternatives for the Alligator Chain and Lake Gentry Extreme Drawdown Project. Those alternatives are listed as follows: (1) The "No Action" alternative under which the lakes would remain in their degraded states; (2) Alligator Lake Chain & Lake Gentry Habitat Enhancement Project based on a 1997 plan to lower Alligator Lake to 58.5 ft., and lower Lake Gentry to 56.5 ft. - Under this alternative, the Alligator Chain's extreme drawdown would begin in October of the first calendar year. The lake levels would be lowered to and held at approximately 58.5 ft. until June of the second calendar year when refilling would begin. Lake Gentry's extreme drawdown would begin in November of the first calendar year. Lake Gentry would be lowered to and held at approximately 56.5 ft. until June of the second calendar year when refilling would begin. Associated structural measures and muck removal would be accomplished; (3) Alligator Lake Chain & Lake Gentry Habitat Extreme Drawdown and Enhancement Project, which would lower Alligator Lake to 60.0 ft., and lower Lake Gentry to 56.5 ft. Under this, the previous preferred alternative, proposed regulation schedule modifications would begin in October of the first calendar year. The Alligator Lake Chain's regulation schedule would remain at its summer pool level of 63.0 ft. through October and into November, and on November

14th the extreme drawdown of the Alligator Chain would begin. The lake levels would be lowered to and held at approximately 60.0 ft. until June of the second calendar year, when refilling would begin. Lake Gentry's regulation schedule would remain at its summer pool level of 61.0 ft. through October and into November of the first calendar year, and on November 10th the extreme drawdown of Lake Gentry would begin. Lake Gentry would be lowered to and held at approximately 56.5 ft. until June of the second calendar year, when refilling would begin. Associated structural measures and muck removal would be accomplished; (4) Lake Gentry Postponement Alternative - this alternative is identical to the preferred alternative, except that the extreme drawdown of Lake Gentry would be postponed to a later date. Lake Gentry would, however, be lowered sufficiently to facilitate water movement out of the Alligator Chain. All of the alternatives are discussed in detail in Section 2.0.

In August of 1997 concerns were raised over the possibility that drawing down the lakes may cause groundwater levels in the vicinity to drop, resulting in water loss to commercial fish farm ponds, and a reduction in freeze protection for both aquacultural and agricultural interest located in the area. Results of extensive modeling studies undertaken by the SFWMD indicate that two of the fish farms, Blackwater Fisheries and Moonlight Fisheries, may potentially be affected by the lowering of water levels in the lakes. The greatest potential for impacts exists with severe drought conditions. Based on comments received in response to coordination of the Draft Environmental Impact Statement with agencies and the public, it was identified that adopting the Lake Gentry Postponement as the preferred alternative would reduce the potential impacts of the extreme drawdown on the adjacent surficial aquifer at the Moonlight fish farm. The preferred alternative is one of several measures, which can be implemented to offset potential impacts.

In late 1998, concern was raised as to whether the proposed drawdown would have detrimental effects to protected species, such as the endangered snail kite (*Rostrhamus sociabilis plumbeus*). In their letter of October 1, 1998, the U.S. Fish and Wildlife Service (USFWS) stated that resource management agencies generally support extreme drawdowns on the basis of improving the overall ecological function in lakes. Removal of sediments and choking vegetation is beneficial to the snail kite because overly dense vegetation limits feeding opportunities. This is true of other species as well.

Concerns were also raised over placing dredged sediments from the lake bottom back into the lake as wildlife islands. The issue here being that contaminants, such as heavy metals, may be concentrated in the material. The Florida Fish and Wildlife Conservation Commission has been conducting tests on these sediments, and analysis of the samples indicates that heavy metal contaminants are not present in levels that exceed U.S. Environmental Protection Agency (EPA) Region IV Sediment

Screening Criteria for hazardous waste sites, or Florida Department of Environmental Protection (FDEP) Soil and Sediment Cleanup Goals Criteria. Therefore, it has been determined that excavation and placement of these materials should not cause degradation of habitat or water quality.

Completion of the proposed drawdown plan is expected to result in long-term benefits and some temporary adverse effects during the actual drawdown. However, over the long run, an increase in beneficial productivity, and preservation and enhancement of a valuable aquatic resource will be realized.

**FINAL ENVIRONMENTAL IMPACT STATEMENT**  
**Alligator Chain of Lakes and Lake Gentry Extreme Drawdown**  
**AUGUST, 1999**

**1.00 NEED FOR AND PURPOSE OF ACTION**

**1.01. PROJECT LOCATION**

The Alligator Chain of Lakes and Lake Gentry are located in Osceola County, Florida, near the city of St. Cloud, approximately 25 miles southeast of Orlando (see location map, page 3).

**1.02. NEED FOR ACTION**

The Florida Fish and Wildlife Conservation Commission (FWC) has requested an extreme drawdown of the Alligator Chain and Lake Gentry to reverse the general decline of the lakes' aquatic habitat quality. The South Florida Water Management District (SFWMD), U.S. Fish and Wildlife Service (FWS), Florida Department of Environmental Protection FDEP), Osceola County and the U.S. Army Corps of Engineers, Jacksonville District (Corps) cooperated with the FWC to develop a plan to implement the drawdown. The extreme drawdown plan will affect parts of Osceola County, Florida. Appendix I (App. I) contains a detailed description of this plan including water regulation schedules and structural measures. Regulation schedules for two calendar years would be modified to facilitate the extreme drawdown and habitat enhancement project on the Alligator Chain (as of August 1999, the Alligator Chain drawdown is scheduled for 1999/2000). Regulation schedules for two calendar years would be modified to facilitate the extreme drawdown and habitat enhancement project on Lake Gentry (the first of these two calendar years could be as early as the second calendar year of the regulation schedule changes for the Alligator Chain's extreme drawdown).

**1.03. PURPOSE OF ACTION**

The purpose of the proposed extreme drawdown is to improve the Alligator Chain and Lake Gentry's aquatic habitat. This would be accomplished by implementing an extreme drawdown of the Alligator Chain and Lake Gentry. During the drawdown, approximately 3,450 acres of bottom sediments would dry and compact to stimulate growth of desirable aquatic vegetation and increase overall productivity of fish and associated wildlife and habitat. To promote and enhance this natural process during the drawdown, the FWC and others working under its permit would use heavy equipment to remove, burn, and disc the muck and nuisance vegetation from areas where long-term lake level stabilization has caused severe aquatic habitat deterioration.

**1.04. RELATED ENVIRONMENTAL DOCUMENTS**

A Draft Environmental Assessment and proposed Finding of No Significant Impact were circulated for public review and comment on August 4, 1997.



Based on comments received and issues raised, it was determined that additional information and studies needed to be incorporated, and the EA process was discontinued. The Draft Environmental Impact Statement (DEIS) dated August 1999 and subsequent coordination continues the National Environmental Policy Act Process for the proposed action.

#### **1.05. PERMITS, LICENSES, AND ENTITLEMENTS**

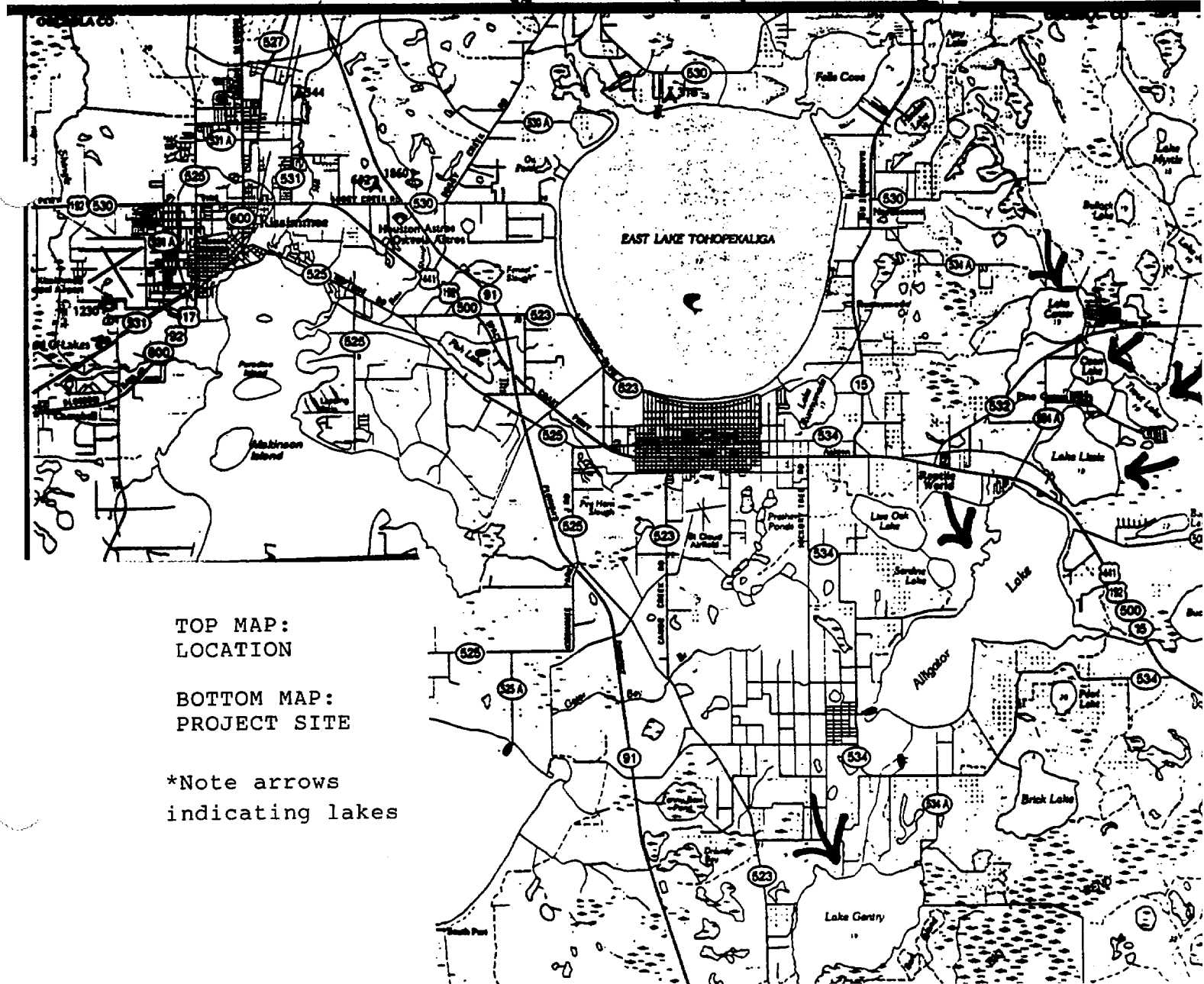
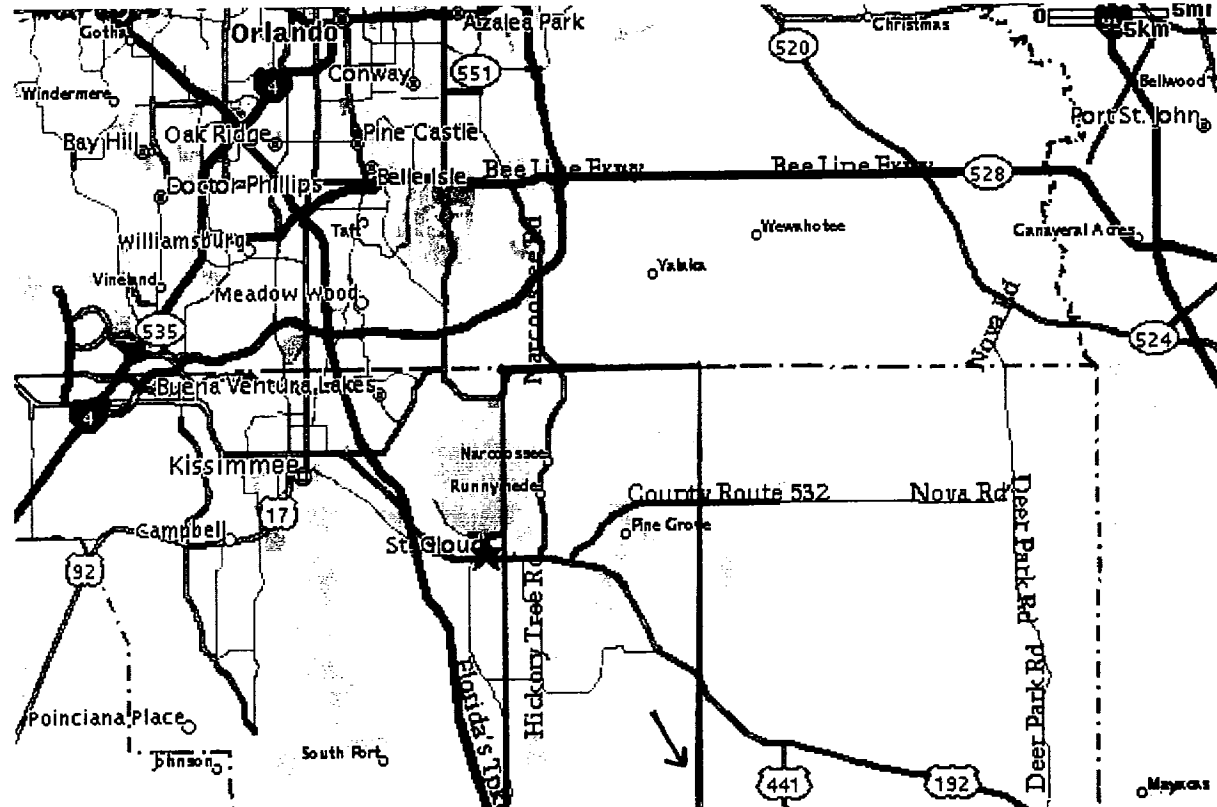
The FWC has applied for and received Florida Department of Environmental Protection Permit #49-128995-001, and Department of the Army Permit (DOA) #1977-03143 (IP-EB)(Appendix IV), for work associated with the Alligator Lake Chain & Lake Gentry Habitat Enhancement Project. Public Notice #199703143 was circulated for comment prior to issuance of permits. In accordance with the Clean Water Act (CWA) a 404(b)(1) evaluation was made as part of the DOA permit process.

#### **1.06. BACKGROUND**

Water levels in the Kissimmee Basin lakes have been regulated by Central and Southern Florida(C&SF) Project works since the 1960's. The Kissimmee River Basin and Related Areas General Design Memorandum, Part II - Supplement 5 stated the following objectives for the Kissimmee River Comprehensive Plan:

- a. Protection of lands adjacent to the lakes and along the Kissimmee River from frequent and prolonged flooding.
- b. Provision of water supply for agricultural uses in the area around the lakes and along the Kissimmee River.
- c. Maintenance of lake stages at a desirable level for fish and wildlife and for recreational purposes.
- d. Prevention or reduction of any adverse effects which may occur in Lake Okeechobee resulting from implementation of the Kissimmee River Comprehensive Plan.

**1.06.1 IMPACT OF STABILIZED LAKE LEVELS:** The Alligator Lake Chain and Lake Gentry are connected by a series of canals allowing water flow and navigation between the lakes. The SFWMD operates water control structures S-58 to the north and S-60 to the south of the Alligator Chain to maintain flood protection around these lakes. Water from these lakes is discharged south to Lake Gentry, although more limited flow can be sent north towards Lake Joel. Lake Gentry water levels are controlled by S-63 which is operated by the SFWMD. Kissimmee Basin lake



TOP MAP:  
LOCATION

BOTTOM MAP:  
PROJECT SITE

\*Note arrows  
indicating lakes

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regulation schedules have been developed for flood control, navigation, agricultural water supply, and environmental enhancement (these schedules are described in Section 3.11).

The Kissimmee Basin lakes in central Florida offer some of the State's best fish and wildlife habitat and are considered a major Florida recreational resource. The Alligator Chain of Lakes and Lake Gentry are a subset of the Kissimmee Chain of Lakes, located in Osceola County, Florida. The Alligator Chain of lakes includes Alligator, Brick, Lizzie, Center, Coon and Trout lakes. Water levels in the Alligator Chain and Lake Gentry now fluctuate over a more narrow range than they did before the C&SF project works were constructed. \*Lake level stabilization has contributed to the rapid growth of dense nuisance vegetation in prime lakeshore aquatic habitat, which supports numerous species of fish, waterfowl, wading birds and wildlife (Dooris & Courser, 1976; Holcomb & Wegener, 1971; and Wegener & Willams, 1974). The density of this vegetation impedes sport fish production and seriously limits fishing, boating, wading, bird watching and other lakefront recreational pursuits. To meet present and future demand for the high-quality aquatic habitat of this resource, the maintenance drawdown of the Alligator Chain and Lake Gentry is required.

\* (See parts 1(d) and 1(e) of Appendix I and the graphs referred to therein)

## **2.00 ALTERNATIVES**

### **2.01. DESCRIPTION OF ALTERNATIVES**

Four alternatives to addressing the habitat enhancement project were examined: No action; drawdown Alligator Chain to 58.5 feet, and Lake Gentry to 56.5 feet (all lake level elevations herein refer to the National Geodetic Vertical Datum of 1929 or NGVD); drawdown Alligator Chain to 60.0 feet and Lake Gentry to 56.5 feet; and drawdown Alligator Chain to 60.0 feet and postpone drawdown of Lake Gentry.

2.01.1. NO ACTION. This alternative results in the continued buildup of organic sediments, and the spread of nuisance vegetation, which will accelerate habitat quality decline. This would be attributed to an increase in exotic aquatic plants and corresponding decline in native plant species on which fish food abundance and diversity depend. Sport fish production, migratory waterfowl, wading birds and associated wildlife will continue to decline with a concomitant decrease in recreational activities. These valuable resources would be allowed to deteriorate while demand pressures will continue to increase. This alternative is not considered desirable or viable.

2.01.2. ALLIGATOR LAKE CHAIN & LAKE GENTRY HABITAT ENHANCEMENT PROJECT BASED ON 1997 PLAN - WATER REGULATION SCHEDULES AND STRUCTURAL MEASURES. Under this alternative, the

extreme drawdown would affect regulation schedules for the Alligator Chain, Lake Gentry, and Lakes Joel, Myrtle and Preston within two calendar years. The regulation schedules for Lakes Joel, Myrtle, and Preston would be modified to facilitate the drawdown and subsequent refill of the Alligator Chain and Lake Gentry. However, the regulation schedule elevations for Lakes Joel, Myrtle, and Preston would still be within their normal range. Structural measures, including the construction of a temporary steel weir in Canal 33 (C-33) and a temporary earthen plug with a culvert riser in C-32C and the use of pumps at both locations to facilitate water movement out of the lakes, would be necessary to implement the regulation schedule changes. The temporary structures would affect navigation. Where possible, the FWC will, upon request, assist affected area commercial interests and the general public in submitting and obtaining State/Federal shoreline rehabilitation and maintenance dredging permits. Unless otherwise indicated by the FWC, work with the FWC on the permit applications should begin at least eight months prior to initiation of the planned shoreline rehabilitation or maintenance dredging work.

The Alligator Chain's extreme drawdown would begin in October of the first calendar year. The lake levels would be lowered to and held at approximately 58.5 ft. until June of the second calendar year when refilling would begin. Lake Gentry's extreme drawdown would begin in November of the first calendar year. Lake Gentry would be lowered to and held at approximately 56.5 ft. until June of the second calendar year when refilling would begin. Approximately 4,245 acres of sediments would dry and compact during the drawdown period. The rate of refilling for the Alligator Chain and Lake Gentry would depend on rainfall. Ideally, refill would be complete by the end of the rainy season. With normal rainfall, the Alligator Lake Chain and Lake Gentry should return to normal low pool stages by fall of the second calendar year.

This alternative essentially represents the original drawdown plan for 1997-98; the drawdown was rescheduled and the plan modified (see Sections 2.01.3, 2.02 and 2.03 below).

**2.01.3. LAKE GENTRY POSTPONEMENT ALTERNATIVE(SELECTED ALTERNATIVE).** This alternative is identical to the alternative in item 2.03, below, except that the extreme drawdown of Lake Gentry would be postponed to a later date, within the timeframes of the existing FDEP and USACOE permits. Lake Gentry would, however, be lowered sufficiently to facilitate water movement out of the Alligator Chain. This alternative would reduce the potential impact of the extreme drawdown on the adjacent surficial aquifer at the Moonlight fish farm, which is located between Lakes Gentry and Alligator, about a mile from each lake.

Based on comments received in response to coordination of the Draft EIS with agencies and the public, it was identified that adopting this alternative as the

preferred alternative would reduce the potential impacts of the extreme drawdown on the adjacent surficial aquifer at the Moonlight fish farm.

In the Lake Gentry Postponement Alternative, the regulation schedules in Figures 1 through 6 would be used in the two calendar years in which the Alligator Chain's extreme drawdown is conducted. However, during the Alligator Chain's extreme drawdown, the Lake Gentry regulation schedules in Figures 3 and 4 would not be used to lower Lake Gentry to the extreme drawdown level of 56.5 ft NGVD; rather, these schedules would be used to lower Lake Gentry to and maintain it at approximately 59.0 ft NGVD as needed to facilitate water movement out of the Alligator Chain.

In a subsequent year, possibly as early as calendar year 2 of the Alligator Chain's extreme drawdown, the extreme drawdown of Lake Gentry would begin and would continue the next year. The Lake Gentry regulation schedules in Figures 3 and 4 would be used to lower Lake Gentry to and maintain it at, approximately, the extreme drawdown level of 56.5 ft NGVD. The Alligator Chain regulation schedules in Figures 1 and 2 and the Lakes Joel, Myrtle, and Preston regulation schedules in Figures 5 and 6 would not be used during the extreme drawdown of Lake Gentry.

During preparation of the Final EIS, a refinement has been made to the Lake Gentry Postponement Alternative to further reduce the potential impact of the extreme drawdown project on the adjacent surficial aquifer at the Moonlight fish farm. This refinement would be a modification of the Alligator Chain's regulation schedule to aid in refilling Lake Gentry after Lake Gentry's extreme drawdown. During the second calendar year of Lake Gentry's extreme drawdown, the Alligator Chain's regulation schedule would be maintained at the high pool elevation of 64.0 ft NGVD from mid-March through the end of March and then would decline to the summer pool elevation of 63.2 ft NGVD by the end of May. In June, water from the Alligator Chain would be used to help refill Lake Gentry. However, the Alligator Chain would not be lowered below approximately 62.0 ft NGVD in order to refill Lake Gentry. The modified Alligator Chain regulation schedule is shown in Figure 2a.

Detailed information on the plan to implement the proposed project can be found in Appendix I. The Lake Gentry Postponement Alternative is essentially identical to the previous preferred alternative in Section 2.03 except for the provision that Lake Gentry's extreme drawdown would be postponed to a subsequent year, the provision that Lake Gentry would be lowered to 59.0 ft NGVD during the extreme drawdown of the Alligator Chain, and the refinement mentioned above. Thus, the Lake Gentry Postponement Alternative includes construction of a temporary earthen plug with a culvert riser in C-32C and the use of a pump there; the possibility of construction of a temporary structure to maintain water levels in Brick Lake (although the planned location and probably the type of structure have changed, as discussed in Appendix I); and provisions pertaining to

assistance by the FWC (formerly FGFFC) with certain efforts at obtaining permits, as discussed in Section 2.03.

## **2.02. ISSUES AND BASIS FOR CHOICE**

In August of 1997 concerns were raised over the possibility that drawing down the lakes may cause groundwater levels in the vicinity to drop, resulting in water loss to commercial fish farm ponds, and a reduction in freeze protection for both aquacultural and agricultural interests located in the area. Results of extensive modeling studies undertaken by the SFWMD indicate that two of the fish farms, Blackwater Fisheries and Moonlight Fisheries, may potentially be affected by the lowering of water levels in the lakes. The greatest potential for impacts exists with severe drought conditions. The preferred alternative is one of several measures which can be implemented to offset these impacts. Other options include placing a structure in the vicinity of Brick Lake Canal to maintain water levels in Brick Lake, and placing a structure in the large drainage ditch that runs through the Blackwater Fisheries property, which would hold water on this property while the drawdown is being conducted. If the proposed regulation schedules for the extreme drawdown are not approved prior to the start date of the proposed regulation schedule modifications, water control operations will be performed according to approved regulation schedules until the drawdown schedules are approved. At that time, operations according to the drawdown schedules would be initiated. It is also proposed that, at the discretion of the FWC and USACE, the drawdown regulation schedules may be implemented at a later date if it appears that a successful drawdown and habitat enhancement project cannot be conducted in the time period for which it is planned.

### **2.02.1. MODIFICATIONS TO ADDRESS CONCERNS RAISED BY PUBLIC**

The previous preferred alternative, below, is a modified version of the alternative discussed in 2.01.2, which is generally based on the plan presented in the draft Environmental Assessment (DEA). The DEA was coordinated for public comment on August 4, 1997. Modifications were made to this alternative in order to address concerns raised by the public. The two main modifications were the decision to lower the Alligator Chain's regulation schedule only to 60.0 ft instead of to 58.5 ft., and the possibility that SFWMD will construct a temporary structure in Brick Lake Canal. Lowering the Alligator Chain's regulation schedule only to 60.0 ft. offers the following advantages: A decreased potential for impacts to the adjacent surficial aquifer, and therefore a decreased potential for impacts to fish farms; a decreased potential for impacts to freeze protection provided by the lakes of the Alligator Chain; increased likelihood of reaching the drawdown low pool stage, and elimination of the need to install a temporary weir and pump in C-33 to facilitate water movement from the Alligator Chain to Lake Gentry; unimpeded navigability between the C-33 boat ramp and Alligator Lake; increased potential to meet refill goals; and better navigational access due to greater water depth in canals between lakes of the Alligator Chain and in residential canals. Despite these many advantages, the change in the

drawdown low pool stage is not expected to significantly reduce the amount of muck to be removed. Addition of the temporary structure in Brick Lake Canal to the project plan would provide the following advantages: A decrease in the amount of water to be removed from the Alligator Chain, and correspondingly, an increase in the likelihood of reaching the drawdown low pool stage; increased potential to meet refill goals, and decreased potential for impacts to freeze protection and cattle fencing.

### **2.03. ALLIGATOR LAKE CHAIN & LAKE GENTRY HABITAT EXTREME DRAWDOWN AND ENHANCEMENT PROJECT - WATER REGULATION SCHEDULES AND STRUCTURAL MEASURES (PREVIOUS PREFERRED ALTERNATIVE).**

The extreme drawdown would affect regulation schedules for the Alligator Chain and Lake Gentry within two calendar years. The regulation schedules for Lakes Joel, Myrtle, and Preston would be modified to facilitate the refill of the Alligator Lake Chain and Lake Gentry. However, regulation schedule elevations for Lakes Joel, Myrtle, and Preston would remain within the normal range of elevations under the existing regulation schedule. Construction of a temporary earthen plug with a culvert riser in C-32C and the use of a pump there would be necessary to implement the regulation schedule changes. The SFWMD may construct a temporary structure in Brick Lake Canal between Brick Lake and Alligator Lake. The temporary structure would maintain water levels in Brick Lake higher than in the rest of the Alligator Chain during the drawdown. The temporary structure would likely be a weir with a crest elevation of 62.5 feet. The temporary structures would affect navigation. Where possible, the FWC will, upon request, assist affected area commercial interests and the general public in submitting and obtaining State/Federal shoreline rehabilitation and maintenance dredging permits. Unless otherwise indicated by the FWC, work with the FWC on the permit applications should begin at least eight months prior to initiation of the planned shoreline rehabilitation or maintenance dredging work.

The proposed regulation schedule modifications would tentatively begin in October of the first calendar year. The Alligator Lake Chain's regulation schedule would remain at its summer pool level of 63.2 ft. through October and into November, and on November 14th the extreme drawdown of the Alligator Chain would begin. The lake levels would be lowered to and held at approximately 60.0 ft. until June of the second calendar year, when refilling would begin. Lake Gentry's regulation schedule would remain at its summer pool level of 61.0 ft. through October and into November of the first calendar year, and on November 10th the extreme drawdown of Lake Gentry would begin. Lake Gentry would be lowered to and held at approximately 56.5 ft. until June of the second calendar year, when refilling would begin. Approximately 3,450 acres of sediment would dry and compact during the drawdown period. The rate of refilling for the Alligator Chain and Lake Gentry would depend largely on rainfall. Ideally, refilling would be completed by the end of the rainy season. With



normal rainfall, the Alligator Chain and Lake Gentry should return to normal low pool stages by Fall of the second calendar year.

### **3.00 AFFECTED ENVIRONMENT**

#### **3.01. GENERAL ENVIRONMENTAL SETTING**

3.01.1. HISTORIC CONDITIONS: Prior to the construction of the C&SF Project works, the ecological maintenance of the Alligator Chain and Lake Gentry depended on the climatic cycle of flood and drought. During extended periods of either condition, extreme lake level changes occurred. Aquatic plant and animal populations evolved and were controlled by this cyclic pattern. Accordingly, extreme water fluctuations played an important role in sustaining extensive areas of high-quality aquatic habitat.

3.01.2. FLOOD/DROUGHT CYCLE: During floods, tussocks (floating plant islands) and nutrient rich sediment were carried over normally dry floodplains, allowing aquatic organisms to use the flooded terrestrial resources. When floodwaters receded, tussocks and sediment were deposited on dry land. Nutrients from decaying plants and sediment became fertilizer for upland vegetation; the tussock material itself became a temporal topographic floodplain feature supplying food/shelter to terrestrial animals and insects. During extended drought the reverse cycle occurred, exposing large lake bottom areas to the intense Florida sun. During these natural drawdowns tussocks and rooted aquatic plants, along with dead and decaying matter (muck), would consolidate, dry and oxidize. Terrestrial organisms readily utilized these lake bottom resources. This natural cycle of flood and drought maintained the lakes' long-term ecological balance primarily through removal of excess organic material. This resulted in lake water quality improvements favorable to plant and animal communities best suited to these extreme conditions. When average seasonal lake levels recurred, the lakes' capacity to sustain life was restored. Hardy plant and animal species, which survived, reproduced and spawned the next generation of lake life. Populations of these organisms thrived and increased under optimum water quality conditions. However, as lake productivity increased, so did the production of waste. Eventually, dissolved oxygen levels decreased as excessive organic material again built-up; consequently, the lakes' capacity to sustain large communities of fish and associated wildlife gradually declined. The growth, death and decay of floating aquatic plants exacerbated oxygen depletion. This caused the lakes' physical and chemical attributes to further decline. These unfavorable conditions persisted until the above cycle restored the high-quality aquatic habitat.

3.01.3. EXISTING CONDITIONS: C&SF Project authorized purposes and regulation schedules have lead to an artificial and narrow restriction of the range in which the Alligator Chain and Lake Gentry's water levels fluctuate. Historic

high and low stages no longer naturally occur. \*As a result, long-term stabilized water levels cause dense nuisance native and exotic aquatic plant growth near the shore of the lakes' low pool stage. These plants quickly consolidate bottom sediments which form organic berms. The berms promote formation of tussocks which, in conjunction with permanent stands of nuisance aquatic plants, shade-out desirable aquatic plant species and physically eliminate high quality aquatic habitat. The density, reproduction and expansion of undesirable aquatic and terrestrial vegetation along the shore eventually preclude the use of the lake shallows by fish, wading birds, wildlife and the public.

\* (See parts 1(d) and 1 (e) of Appendix I and the graphs referred to therein)

### **3.02. VEGETATION**

Under static lake level conditions, water primrose and cattails are among the emergent nuisance species which propagate along the lakeshore. Aquatic plants, such as the exotic hydrilla (*Hydrilla verticillata*) and the native American lotus (*Nelumbo lutea*), also can increase in density beyond historic abundance in the shallows. This excessive plant growth shades out and eliminates desirable aquatic plants.

### **3.03 FISH AND WILDLIFE**

Desirable aquatic plants, which formerly grew in the broad littoral zones, provided habitat for diverse and abundant planktonic, insect, amphibian and forage fish species. This food base in turn sustained several species of sport fish, waterfowl and wildlife (see 4.02, Fish and Wildlife). Numerous species in these animal groups decline or relocate as nuisance vegetation becomes overly dense, eliminating forage habitat and feeding opportunities. Under the existing lake conditions, sport fishing, hunting, bird watching and other outdoor recreational activities are stifled as the aquatic habitat resource base declines.

### **3.04. ENDANGERED AND THREATENED SPECIES**

The Alligator Chain of Lakes is located within the general range of the endangered snail kite (*Rostrhamus sociabilis plumbeus*), and this species is likely to occasionally feed there. However, concentrated feeding and nesting has not been documented in this area. There is a bald eagle (*Haliaeetus leucocephalus*) nest approximately 0.8 mile west of Alligator Lake. A line of pine and cypress trees, and the distance between the nest and the shoreline should shield the nest tree from the proposed activity.

### **3.05. WATER QUALITY**

Water level stabilization also encourages watershed development. This often causes increased nonpoint source pollution, which exacerbates lake water quality problems. In July of 1997, public concern was raised over drawing down Center Lake, due to an on-site water treatment and sewage facility at a recreational vehicle park adjacent to the lake. It was stated that the sewage system had faulty pipes that allowed the infiltration of groundwater, causing the

both the system and percolation pond to overflow, leading to leakage of overflowing sewage into Lake Center. It was thought that by lowering the water level of this lake, pollutants would be further concentrated. The Corps has discovered, through discussions with the Florida Department of Environmental Protection (FDEP), that this situation has been corrected. Through an enforcement action by FDEP, the sewer lines have been replaced and no longer allow discharge of effluent into the lake. Also, the recreational park is under court order to upgrade or replace the water and sewage treatment plant.

### **3.06. GROUNDWATER**

The groundwater system in Osceola County consists of a thin surficial aquifer and a thick high-permeability rock aquifer separated by a thin confining unit (Schiner, 1993). The hydraulic properties of the surficial aquifer vary considerably in Osceola County; the water table usually ranges from about 2 to 20 feet below land surface and typically is shaped as a subdued reflection of the topography. The surficial aquifer in Osceola County ranges in thickness from about 30 to 270 feet, and generally thickens eastward across the county. The intermediate confining unit varies considerably in thickness, but generally thickens to the south and east of Osceola County from about 40 feet in the northwestern part of the county to 150 feet in the southern part (Schiner, 1993). In the Alligator Chain of Lakes and Lake Gentry area, Schiner indicated that the surficial aquifer is around 150 to 250 feet thick and that the intermediate confining layer is about 50 to 150 feet thick. In the Alligator Lake Chain and Lake Gentry area, the potentiometric level of the Floridan Aquifer is generally lower than the lake levels (Shaw and Trost, 1984). The U.S. Geological Service (USGS) has classified the Alligator Chain of Lakes area as an area of known very low recharge to the Floridan Aquifer as shown on Figure 9. Low to moderate recharge to the Floridan aquifer from the Alligator Chain of Lakes, Lake Gentry, or the surficial aquifer could occur if the confining layer is thin or breached in that area (Shaw and Trost, 1984). Recharge to the surficial aquifer is primarily by rainfall. Other sources of recharge include seepage from streams, lakes, and irrigated lands. Discharge from the surficial aquifer is principally by evapotranspiration. Some discharge also occurs as seepage into streams, lakes, canals, ditches, and withdrawals from wells (Schiner, 1993).

### **3.07. SOILS**

Soils in the lands around these lakes are predominantly sandy soils of the Myakka-Tavares-Immokalee or Basinger-Placid-Samsula soil units as classified by the U.S. Department of Agriculture (Readle, 1979). Analysis of the effect of a drawdown on citrus groves adjacent to Lake Apopka was conducted in preparation for the proposed drawdown of Lake Apopka. The soil types in that area appear to be similar to the soil types in the Alligator Lake Chain/Lake Gentry area (Readle, 1979).

### **3.08. HAZARDOUS AND TOXIC WASTES (HTW)**

The sediments to be dredged from the Alligator Chain of Lakes are comprised mostly of decomposing aquatic vegetation. The lands that drain into the lakes are primarily used for agriculture, with some low-density residential neighborhoods. No heavy industry has ever been sited within the drainage basins. Some commercial enterprises adjacent to the lake do have fuel facilities and the potential for fuel spills at these locations exists. However, major contamination is unlikely due to State fueling regulations and the vigilance of owners, who would be negatively affected by fuel spills and/or site contamination. Furthermore, no contamination due to hazardous and toxic waste spills is known to be in the study area.

### **3.09. HISTORIC, CULTURAL AND ARCHEOLOGICAL RESOURCES**

A review of the Florida Master Site File indicates that there are two recorded pre-Columbian archeological sites within the project area. The project area has not been subjected to a systematic, controlled cultural resources survey, and unrecorded historic properties or isolated artifact occurrences may also be exposed because of the project.

### **3.10. VISUAL RESOURCE CONSIDERATIONS**

Consideration of aesthetic resources within the project study area is required by the National Environmental Policy Act of 1969 (NEPA) PL 91-190, as amended. Aesthetic resources are defined as "those natural and cultural features of the environment that elicit a pleasurable response" in the observer, most notably from the predominant visual sense. Consequently, aesthetic resources are (commonly referred to as) visual resources,...features which can potentially be seen. The project lands are of low relief and provide many panoramic view corridors of open lake waters and adjacent prairie and swamp in the rural setting. Many of the project lakes are rimmed by white sandy shorelines with pine flatlands and or mesic oak hammocks in the immediate background. Some single-family residential development around the project lakes has saved large, majestic, specimen oak trees that are filled with spanish moss. Commercial citrus lands are evident around Alligator Lake and Lake Gentry. Overall the project area possesses good aesthetic characteristics and value.

### **3.11. PREVIOUS LAKE DRAWDOWNS**

The Florida Game and Freshwater Fish Commission (FWC) implemented extreme drawdowns of Lake East Tohopekaliga and Tohopekaliga (Toho) in 1990, Lake Toho in 1971, 1979 and 1987, and Lake Kissimmee in 1977 and 1996. These drawdowns were done to eliminate unwanted aquatic vegetation, facilitate muck removal and to improve overall aquatic habitat. The drawdowns had the desired effects: Bottom sediments did oxidize and consolidate, new vegetation communities were established, and fish food organisms significantly increased with a subsequent increase in sport fish populations (Holcomb and Wegener, 1971; Wegener and Willams, 1974; and Wegener, Willams, and

McCall, 1974). According to Cooke and Kennedy (1989), "Water level drawdown is a multipurpose reservoir impoundment improvement technique. It is used to control some nuisance plants, provide access to dams, docks, and shorelines for repair and installation purposes, for fish management, for sediment consolidation and removal, and for installation of sediment covers."

### **3.12. PURPOSE OF WATER REGULATION SCHEDULES**

The Central and Southern Florida (C&SF) Project was designed and constructed by the U.S. Army Corps of Engineers. The local sponsor for the C&SF Project is the South Florida Water Management District (SFWMD). The Congressionally authorized project purposes for the C&SF Project include flood damage reduction, water supply, preservation of fish and wildlife, recreation, navigation, prevention of saltwater intrusion, and water supply to Everglades National Park. For the Kissimmee Basin Project works the local sponsor, SFWMD, provided lands, easements, right-of-ways, relocations, and dredged material disposal areas. SFWMD operates and maintains the project works in accordance with Corps approved criteria, and holds and saves the United States free from damages due to the construction or subsequent maintenance of the project, except due to the fault or negligence of the Corps or its contractors. The SFWMD is also responsible for water supply allocation from the project, unless where specified by Federal law. The SFWMD, as local sponsor, has an essential role in the development of operating rules and criteria. The C&SF Project involves the operation of a large, complex, multipurpose project. Water control plans contain regulation schedules, rule curves, and operating instructions. Water control plans must blend all the varied, and often conflicting, project purposes. Compromise among competing purposes and objectives is a basic factor in multipurpose water resources project design and operation.

Kissimmee Basin lake regulation schedules essentially represent the seasonal and monthly limits of storage which guide the regulation of water levels for the purposes of flood control, navigation, agricultural water supply, and environmental enhancement. Kissimmee Basin lake regulation schedules normally vary from high stages in the late fall and winter to low stages at the beginning of the wet season. Lake levels are lowered in the spring to provide flood control storage and fish and wildlife enhancement. The minimum levels are set to provide for sufficient flood control storage and navigation depths. The amount of seasonal fluctuation was derived by determining the effect of various water levels on flood control, low water regulation, groundwater, fish and wildlife, and recreation.

The plan developed in the design phase was to provide for removal of runoff from a design storm equal to 30 per cent of the Standard Project Flood (SPF), provide for sufficient regulation capacity for the lakes to limit the rise in lake stage during the design storm to 2 feet or less, provide sufficient capacity for Lake Kissimmee to prevent maximum stages during the SPF from not exceeding those expected under pre-project conditions, provide for navigation, provide for

water control, and maintain lake levels in consideration of recreation and preservation of fishery resources. Runoff during the wet season is stored for use in the dry season. The regulation schedules take into account these varying, and often conflicting, purposes. The regulation schedules form part of the Water Control Plan for the Kissimmee River - Lake Istokpoga Basin (Corps, 1991). The proposed extreme drawdowns would require that special regulation schedules be adopted for certain lakes for two calendar years for each extreme drawdown. These regulation schedules are described in Appendix I, and shown in Figures 1 through 6, including Figure 2a.

## **4.00 ENVIRONMENTAL EFFECTS OF PROPOSED ACTION**

### **4.01. VEGETATION**

Some of the plants which dominated the shallows prior to flood control were coontail (*Ceratophyllum demersum*), knotgrass (*Paspalum distichum*), pondweed (*Potamogeton* spp.), fanwort (*Cabomba caroliniana*), bladderwort (*Utricularia* spp.), arrowhead (*Sagittaria latifolia*) and arrow arum (*Peltandra virginica*).

These and other native plants provide provide a vital forage base for fish, waterfowl, and wildlife. Beneficial effects associated with the drawdown plan include bottom substrate improvements as organic build-up is reduced. This will lead to an increase in diversity and density of desirable vegetation. The drawdown will also allow the control of nuisance aquatic plants, such as hydrilla, water hyacinth (*Eichhornia crassipes*) and American lotus which proliferate under the unnatural static lake level conditions. During the drawdown, control measures will also focus on preventing the spread of exotics to other river basin areas. The amount of tussock mats will also be greatly reduced. Some loss of desirable aquatic vegetation will occur during the drawdown. However, increased control and removal of nuisance vegetation will improve the recruitment potential of desirable aquatic plants after lake refilling. The planning to efficiently control nuisance aquatic plants, before and during the drawdown, will be closely coordinated with the Kissimmee Interagency Aquatic Plant Management Group (KIAPMG), which includes the Corps, the SFWMD, the FWC, and the FDEP.

### **4.02. FISH AND WILDLIFE**

Under optimal conditions, the broad littoral zones bordering the Alligator Chain and Lake Gentry are generally covered with endemic aquatic plants which provide habitat for a great variety of planktonic and higher level forage organisms, including insects, minnows, killifish, reptiles and amphibians. This forage base supports excellent fishing opportunities for such species as largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), redear sunfish (*Lepomis microlophus*) and chain pickerel (*Esox niger*). Other fish species inhabiting the lake include bowfin (*Amia calva*), gizzard and threadfin shad (*Dorosoma cepedianum*, *Dorosoma petenese*), Florida gar (*Lepisosteus platyrhincus*), warmouth (*Lepomis gulosus*),

lake chub-sucker (*Erimyzon sucetta*) and several species of catfish. These littoral zones are also important for over wintering waterfowl such as American coot (*Fulica americana*), ring-necked duck (*Aythya collaris*), Northern pintail (*Anas acuta*) and blue-winged teal (*Anas discors*). The native Florida or mottled duck (*Anas fulvigula*) also feeds in the shoreline marshes and breeds in the adjacent prairies. Wading birds including great and snowy egrets (*Casmerodius albus*, *Egretta thula*), great blue heron (*Ardea herodias*), tricolor heron (*Egretta tricolor*), little blue heron (*Egretta caerulea*), and limpkin (*Aramus guarauna*) feed on forage organisms normally abundant in the shallows. Numerous species of amphibians and reptiles also inhabit these waters; most notable among them is the American alligator (*Alligator mississippiensis*). Game animals using the lake and adjacent land include white-tailed deer (*Odocoileus virginianus*), wild hog (*Sus scrofa*), wild turkey (*Meleagris gallopavo*), quail and dove. After the drawdown, littoral zones will be restored and will again provide the important forage base on which many of the above fish, wildlife, and waterfowl depend for survival.

4.02.1. AQUATIC HABITAT RESTORATION: The previously described general aquatic habitat degradation has negatively affected the productivity and survivability of many of the above mentioned species. Restoring the littoral zones and water quality will reverse this trend. A general increase in the size and numbers of sport fish will also occur. This has been shown by the 1996 habitat enhancement project on Lake Kissimmee. During electrofishing surveys in 1995, numbers of young bass(< 12 inches) were down to 13 sampled per hour. Currently numbers of the same size fish are up to 86 sampled per hour. (Mike Hulon, personal communication). The expected increase in productivity should bring an accompanying increase in the fishing resource value and lead to increased sport fishing, favorably affecting the local economy.

4.02.2. DISPOSAL SITES: Muck removal is planned for seventeen sites, totaling almost fifteen miles of shoreline, and will be conducted in all involved lakes except Lake Brick. Approximately 475,000 cubic yards of organic material will be removed. A portion of this material will be used to create approximately two dozen in-lake wildlife islands. Remaining muck material will be placed in disposal areas that are approved by the permitting agencies (locations of wildlife islands and upland disposal sites are described in figures 32-37). Wildlife islands serve as excellent rookery sites for wading birds. Rookeries on such islands have improved chances of fledgling survivability due to the limited predator access. Wildlife islands also serve as resting and basking areas for reptiles. A study on the Lake Jackson wildlife islands, created in 1994, was conducted between September 1, 1994 and June 30, 1997. During this study, it was documented that over 67 animal species were observed utilizing the islands, and seven different animal species reproduced on the islands. Forty-four species of plants were also observed. (Hulon, Furukawa, Buntz, and Sweatman, 1998). In accordance with the CWA a 404(b)(1) evaluation was completed.

#### **4.03. ENDANGERED AND THREATENED SPECIES**

The Corps has consulted with the US Fish and Wildlife Service (FWS) through the National Environmental Policy Act (NEPA) process and Section 7 of the Endangered Species Act. In a letter dated June 24, 1997, (see Appendix II) the FWS indicated that the planned drawdown is not likely to jeopardize the continued existence or critical habitat of any Federally Listed Endangered and Threatened Species.

#### **4.04. WATER QUALITY**

Reduction of excess organic material will decrease chemical oxygen demand resulting in more stable and higher dissolved oxygen levels in the lake. Water clarity will also improve and light penetration will subsequently increase. The expected increase in light penetration should encourage phytoplankton growth and productivity with an accompanying increase in zooplankton and higher-level forage organisms.

#### **4.05. AIR QUALITY AND NOISE**

Some temporary local increase in particulate and hydrocarbon emissions is expected during the muck removal operations due to the movement of heavy equipment. All applicable air quality regulations will be implemented to minimize these effects. The operation of machinery will also create additional noise that is likely to disturb some residents living adjacent to the lakes during daytime working hours. Once the project is completed, air quality and the noise environment will be the same as before project conditions.

#### **4.06. HISTORIC, CULTURAL AND ARCHEOLOGICAL RESOURCES:**

Two archeological sites have been recorded within the project area, and unrecorded historic properties or isolated artifact occurrences may also be exposed because of the project. In a letter dated June 27, 1997, the Florida State Historic Preservation Officer (SHPO) recommended that a professional archeologist identify and clearly mark the known archeological sites in the field, and that impact to the sites be avoided during project execution. The SHPO also recommended that the known sites and any discovered historic properties be patrolled by the project proponent during project execution to prevent vandalism to the resources. With the implementation of these stipulations by the permit applicant, the Corps has determined that the project will have no effect on historic properties listed on or eligible for listing on the National Register of Historic Places. In a letter dated August 18, 1997, the SHPO concurred with this determination, in compliance with the National Historic Preservation Act of 1966, as amended, and 36 CFR Part 800.

#### **4.07. WITH PROJECT CONDITIONS**

The proposed extreme drawdown to expose lake bottom would produce foreground aesthetic impacts for the drawdown duration. The panoramic views of the high quality lake waters would be minimally reduced for the extreme drawdown duration. Associated lake wildlife would also be further away from existing



shoreline activities and views. The extreme drawdown alternatives would temporarily affect shoreline aesthetic to the Alligator Chain and Lake Gentry. Shoreline aesthetics of feeder Lakes Joel, Myrtle and Preston could be slightly affected during the proposed project, but would be within their normal lake level ranges. With the restoration of historic water levels in the project lakes, panoramic aesthetic views would be returned with improved wildlife habitat. Temporary construction impacts will include an increase in the air and noise pollution in the project area. Some increase in organic odors could also occur. These temporary impacts will most likely cease once the project has been constructed and historic water levels have been returned. Drawdown of the lakes in the region for two years could produce some long-term impacts to aging hydric trees in the project area. These potential impacts could degrade lake aesthetics within the project area and beyond.

#### **4.08. NAVIGATION AND RECREATION**

The FWC has applied for and received a Department of the Army permit to place an earthen plug in Canal C-32C which will block navigation in the dead-end canal reach between Trout Lake and the spillway S-58. The Brick Lake Canal structure, if installed, will block navigation between Brick and Alligator lakes. Temporary navigation restrictions on and access between the lakes, with accompanying inconvenience to anglers and possible loss of revenue to fish camp operators, are unavoidable (see 2.03). In addition to the effects on recreational boating which will result from the temporary structures described above, recreational boating between the lakes of the Alligator Chain will be impeded when the lakes are at their drawdown low pool of 60.0 ft. There will be spots in the canals between Alligator Lake and Lake Lizzie, and between Lake Lizzie and Coon Lake, where the depth will be less than two feet. Also, at the mouths of all the canals where they enter the lakes, the water depths will be shallow, often less than two feet. Additionally, access in the main bodies of all lakes (including Lake Gentry when its drawdown occurs) will be impacted as lower water levels will limit recreational boating. Since the purpose of this project is fisheries and habitat enhancement, there is expected to be a long-term benefit and overall improvement to navigation and recreation via the reduction of floating tussocks and an increase in fisheries.

As Stated in their letter of November 13, 1998, the Seventh Coast Guard District, Aids to Navigation and Waterways Management Branch, has no objection to the drawdown of the Alligator Chain of Lakes and Lake Gentry (see Appendix II).

#### **4.09. DOWNSTREAM EFFECTS**

The extreme drawdown of the Alligator Chain and Lake Gentry is not expected to adversely affect downstream water quantity or quality conditions in the Kissimmee River, Lake Okeechobee, the Everglades, or any receiving estuaries.

#### **4.10. HAZARDOUS AND TOXIC WASTE (HTW)**

Given the present and past land uses, there is little chance that the sediments contain pesticide or heavy metal contaminants at concentrations that exceed normal background for central Florida lake sediments. A Tier 1 evaluation of the possibility of sediment contamination was performed by comparing regionally available data with expected conditions. The FWC collected sediment samples from Lake Tohopekaliga in 1986 and analyzed the samples for heavy metal contamination. The laboratory results indicate that the concentrations of Cadmium, Lead, and Mercury in these sediments are 4 to 300 times lower than the Florida State Criteria for Clean Soils (Chapter 62-775.400). A comparison of past and present land use indicates that Lake Tohopekaliga is more likely to show indications of anthropogenic sediment deposition than the Alligator Chain of Lakes. Since there is no evidence that Lake Tohopekaliga sediments are contaminated, it is reasonable to infer that the sediments in the Alligator Chain of Lakes are also uncontaminated. Concerns were also raised over placing dredged sediments from the lake bottom back into the lake as wildlife islands. The Florida Game and Freshwater Fish Commission has been conducting tests on these sediments, and analysis of the samples indicates that heavy metal contaminants are not present in levels that exceed U.S. Environmental Protection Agency (EPA) Region IV Sediment Screening Criteria for hazardous waste sites, or Florida Department of Environmental Protection (FDEP) Soil and Sediment Cleanup Goals Criteria. Therefore, it has been determined that excavation and placement of these materials should not cause degradation of water quality.

#### **4.11. FREEZE PROTECTION**

**4.11.1. EFFECT OF LAKES ON NEARBY ATMOSPHERIC TEMPERATURES:** Lakes such as those of the Alligator Chain and Lake Gentry can have an influence on atmospheric temperatures near the lakes. This is due to the high heat storage capacity of water, as compared to that of organic soils and sands. When the atmospheric temperature falls below the water temperature, heat is transferred from the water to the atmosphere. Wind also plays an important role in temperature modification because it pushes the warmed air from the surface of the lake over the surrounding area. The amount of temperature modification decreases with distance from the lake (Ingram, 1983). According to Bill et al (1977), lakes, being warmer than the air and surrounding land, release sensible and latent heat under typical cold conditions after passage of a front. No substantial thermal effects to the surrounding lands should be expected under low wind conditions.

**4.11.2. LAKE APOPKA STUDY:** Although the ability of lakes to modify nearby temperatures is intuitively easy to understand, quantification of this effect is difficult due to many uncertainties and complexities. According to Rogers and Rohli (1991), the relationship between air temperature and freeze severity is complicated by several factors, including the age of the citrus trees, current